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UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE RO

REPLY TO: 3420 DATE: AUG 28 1986

SUBJECT: Biological Evaluation of Declining Incense-cedars along the West Shore of Lake Tahoe (Report No. 86-16)

TO: Forest Supervisor, LTBMU

On July 9-10, 1986, Gregg DeNitto, pathologist, and Dave Schultz, entomologist, of the FPM Program met with Bob McDowell and Jim Schellenger of your staff. The purpose of the visit was to evaluate the decline of incense-cedars along the west shore of Lake Tahoe from Tahoma to Kings Beach. Incense-cedars have had symptoms of crown decline since the early 1980's, resulting in some mortality. Your Recreation and Timber, Range, and Wildlife (TRW) Staffs were concerned about the cause(s) of this continuing decline and what options might be available to minimize losses.

Symptoms of crown decline of varying degrees were observed along the west side of Lake Tahoe beginning around Sugar Pine Point State Park and northward. These symptoms included chlorosis and death of new foliage, twig death, and reduced height growth. Symptoms were expressed on the newest growth first and, as symptoms became more severe, advanced to the older growth. Trees of all size classes were affected, although severe symptoms on the predominant and dominant trees were visually more evident.

In general, severity of symptoms increased from south to north along Highway 89. The most severe symptoms were observed in the Tahoe City area. Declining trees were evident some distance from the highway and the road did not appear to be an influencing factor. Similarly, declining trees were present around both developed and undeveloped areas. Although there was some tree mortality, it was not common.

Closer observations of affected trees revealed several organisms on declining tree parts. A very small percentage of the foliage was killed by being mined by larvae of a small moth in the genus Argyresthia. A beetle, probably a species of Phloeosinus, was mining in the pith of some twigs that had died. Fruiting bodies of a fungus, Lophodermium juniperinum, were on some dead scales. None of these are aggressive pests and they are usually limited to dead, moribund, or declining tree parts. Small, black necrotic spots were observed on some dead scales, but a cause could not be determined. The spots appeared to be collections of dead plant cells without any

other organism being present in or around the cells. None of these factors, however, were consistent enough to be responsible for the amount of damage that was present.

Increment cores were taken from several incense-cedars at William Kent Campground and around Tahoe City. A pattern of radial growth consistent between trees was not observed. Suppressed trees had no change in annual radial increment over the past 10 years. Open-grown trees had declined in annual radial increment during and following the 1976-77 drought. These trees did not respond to increased moisture following the drought, but maintained approximately the same rate of slowed radial growth until the last 3 years when this rate decreased further.

Precipitation records since 1974 were examined for Tahoe City to see if any correlation could be made with the observed decline. Prior to 1981 there was a general moisture reduction compared to normal. Since 1981 there has been a surplus, although the springs of 1984 and 1985, especially the latter, were drier than usual. Other than considerable fluctuations from normal, both surplus and deficiency, the overall moisture situation has improved since the mid-70's drought. It is difficult to accept moisture relationships as the only causal agent involved with the decline.

The decline of incense-cedars in the Basin appears to be the result of multiple factors that have yet to be defined. These factors, some probably abiotic in nature, appear to be increasing stress in the trees resulting in crown dieback. This dieback may be a result of feeder root necrosis and the subsequent inability of a tree to supply sufficient water to its foliage. The severity of the decline is probably because of the lack of aggressive insects and pathogens on incense-cedar. Other species in the Basin, such as pines and true firs, are usually killed by more aggressive pests before decline symptoms become as severe. The cedars, therefore, survive longer until their storage reserves are depleted and they cannot produce sufficient food, or until they have insufficient water-absorbing and translocating ability.

At this time, we cannot provide an answer as to the causes of this decline. It is recommended that my Staff work with your personnel to establish monitoring plots in affected areas and follow the progression of this decline to determine if the condition deteriorates or improves. In these plots we would identify and photograph specific trees so that their condition can be followed for several years through annual evaluations. We will contact your TRW Staff to see if this is acceptable and to implement any necessary actions. Please contact Gregg DeNitto at 415-556-6940 if you have any questions.

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